SCIENCE.

FRIDAY, AUGUST 8, 1884.

COMMENT AND CRITICISM.

APROPOS of the appointment of the electrical commission mentioned last week in our notes, is not the manner in which candidates are selected for scientific appointments at Washington worthy of serious consideration? There seems to be no scientific authority there who feels entitled to come forward in such cases, and represent the views of scientific men. If the latter are appealed to, to come forward themselves, the almost universal answer is, that they do not feel that their opinions would receive serious consideration at the hands of the appointing power; and that, if the authorities really care for their opinions, it is very easy to ask for them. But, unfortunately, business at the national capital is not arranged on any such system. An appointing power is not an active personage who investigates for himself, but the occupant of a seat at an office-desk, waiting for people to come forward and present their views. This personage does not assume that any one has any views unless he comes forward with them, and is not disposed to go around in search of opinions as long as he finds himself plentifully supplied with the article, ready-made, and thrust upon him. If asked to obtain the views of learned men, his reply would be a general invitation to all that class to come forward. Let the reader imagine, if he pleases, an 'industry' or an 'interest' too modest to address the authorities.

The bad effect of this state of things need not be dwelt upon: the practical question is, how it can be remedied. The only remedy is to have some central scientific authority, in intimate relations with the administration, ready to come forward and represent the scientific opinion of the country on all occasions when the interests of science are involved. If we had a department of science, its head would naturally perform these functions: in the absence of this agency, and of any special statutory provision, nothing can be effectively done, unless our leading scientific men will lay aside modesty, and accept the disagreeable features of the situation. An unofficial representative, on confidential terms with the leading members of the administration, might be nearly as effective as a department. But, mortifying though it may be, the general rule is that official position, as the responsible head of an establishment of some kind, is necessary to enable any man to command any real weight.

A STRIKING similarity may be observed between the history of names of individuals among men, and the history of scientific names given to natural objects. In zoölogy the species or variety stands in the same relation to the naturalist as the individual man stands to his fellows. The object of names is in both cases to distinguish absolutely the species, variety, or individual, from others about it. When men live in comparatively small communities, and each individual leads a stationary life, one name has generally been found sufficient; but in larger communities, or where a constant mingling of the people takes place through political commotions or increased facility for travel, a necessity arises for binomial or trinomial, or even longer names.

Thus in England, in Saxon days, one name, as a rule, sufficed; but after the conquest binomial names were gradually adopted, though these had an earlier origin in France. Binomial nomenclature answered until the eighteenth century, when trinomial names began to be introduced, and now prevail. These now are often insufficient to meet the wants of modern man, to distinguish him as an individual, to

enable him to receive his telegrams and letters when in the midst of such centres of population as London, Paris, Berlin, or New York; and thus the evolution of the four and five divided polynomial names is actually occurring, which, before another half-century, will doubtless be as common as trinomial names are to-day. In the United States the changes have taken place more slowly than in England, and in that country less rapidly than in Germany and France. In America the trinomial system began to be adopted about the middle of the eighteenth century, but did not acquire prominence until well into the first quarter of the present century. In these remarks regard is paid to the mass of the people; for the nobility, and in some regions the pride of descent, have hastened or modified the general law of name evolution, while even in England, in some isolated districts, one name alone quite recently sufficed.

Turning to natural history, it can be seen that in mineralogy and lithology the species are comparatively few, and a single name is used; although traces of a binomial system can be seen in the latter, in such names as quartz porphyry, olivine diabase, hornblende andesite, etc. Several attempts, indeed, have been made to introduce a binomial nomenclature in mineralogy, but they have always failed because both unnecessary and unnatural. In zoölogy and botany, in the olden time, one name was used; but as these sciences increased in exactness, and in the number of their species, the binomial system was introduced by Linné. This has answered the purposes of science for a long period; but the multiplicity of the species and varieties known has now become greater than the capabilities of that system, and a polynomial nomenclature is being surely evolved. Indeed, triple and quadruple names are as inevitable to designate species and varieties, of animals at least, as such names have been found to be for individual men; and the wise and philosophic naturalist is undoubtedly the one who adapts his system to the tendency of the times, — the inevitable.

Two modes seem available to meet this, — one by the use of letters or numerals; and the other by the addition, to the generic and specific names now employed, of a third or even fourth name, to indicate the variety and sub-variety so far as need be. The former finds an example in the use of 'sen.,' 'jun.,' '1st,' '2d,' and '3d,' added to distinguish individuals, and of the Roman numerals affixed to the names of kings. This method is confessedly inconvenient and of limited use. The second method accords with the custom of mankind, and would never have been adopted if it had not been the easiest, best, and most natural system for man and his capabilities. The trinomial system of zoölogy (genus, species, and variety) has its olden prototype in the Roman name system, — gens, family, and person; or nomen, cognomen, and praenomen, — although the order of arrangement differs; e.g., Caius Julius Caesar, Lucius Cornelius Scipio. Names, for example, like Turdus fuscescens salicicola would appear, from the above, to be of proper form; but such as Eutaenia sirtalis sirtalis, or Heterdon platyrhinus platyrhinus, are as absurd as it would be to name a person John John Smith or George Washington Washington. The similarity of the laws and methods of development of nomenclature, both for mankind in general and for the naturalist, is not remarkable; for it merely displays the mind of man with its capabilities and limitations, acting on the same problem, — the separation of specials from generals. The resemblances in both cases have been carried out so fully, that even the organic chemists, in their nomenclature, rival that of the highland Scotchman in his palmiest days, and from the same cause, — the line of descent.

It is a good sign that the importance of the explorations undertaken by the Peabody museum is acknowledged by others than those in the immediate vicinity of Cambridge. The broad and national character of the museum is thus slowly meeting with appreciation. When we recall the fact that this is the only museum in the country founded and conducted for the

single purpose of the study of man, it seems impossible that it should long remain without a much larger support from friends of American archeology and ethnology. We hope that the trustees will be encouraged in their efforts by a large increase to the subscriptions for American explorations, in addition to those mentioned in our notes.

EUROPEAN naturalists regard the attention paid in this country to economic entomology, and the aid that has been given it by various states and by the general government, as one sign of 'a practical people.' With all the specialization in instruction in the foreign universities, we are not aware that there is more than one which supports a professorship of entomology. This is Oxford, where the venerable Professor Westwood honors the Hope foundation. In this country, Harvard and Cornell each have their full professorship of this science; and to the latter a summer school, having special reference to agricultural entomology, has now been attached. This seems more appropriate than many of the summer schools now so much in vogue, inasmuch as the objects of study are at this season in the height of their investigations into the power of crops to sustain insect-life. To further the interests of the school, the trustees of Cornell university have relieved Professor Comstock of his duties during the winter *semester;* and an unusually good opportunity is thus afforded to teachers, as well as others, to familiarize themselves with the principles of this branch of economic science.

LETTERS TO THE EDITOR.

*** *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Some United States geologists, and the propylite question.

YOUR reviewer of the recent publications of the U. S. geological survey incorrectly states that Dr. Becker does not give Rosenbusch credit for his prior advocacy of the view that propylite is a modification of andesite (*Science*, iv. p. 67), for Becker does so on p. 90 of his 'Geology of the Comstock lode;' but your reviewer ought to have stated that Wadsworth was the first American to advocate this relation of propylite and andesite, which he did in a paper published before that of Rosenbusch. In Wadsworth's paper it was remarked, that his microscopic studies of the Washoe and other western propylites, collected by Richthofen and the Fortieth parallel exploration, had led him to conclude of these typical propylitic rocks, that "the propylites are all altered andesites, with which species their chemical composition agrees; and that the diagnostic distinctions that Professor Zirkel has placed between the andesites and propylites did not hold good, even in the specimens that he described, as would have been readily seen, had he given complete descriptions instead of the very imperfect and often inaccurate ones that have been published. The distinction between these rocks is simply in the degree of alteration; and they pass directly into each other." [1]

Now, although Messrs. George F. Becker and Arnold Hague are fully known to have knowledge of this publication, they not only ignore completely the priority of Wadsworth, but also use language which would cause any reader not conversant with the subject to believe that Becker was the first American to oppose the species propylite.

In connection with a professed history of the discussion of the Washoe rocks, Becker states, "Baron von Richthofen based the independence of the new rock propylite largely upon the occurrences in the *Washoe district.* Later investigators in the same field, without exception, have adopted his views. Professor Zirkel's characterizations of the microscopical peculiarities of propylite were also founded chiefly on the *Washoe* occurrence. Though at the beginning of the present investigation [April, 1880] I was fully persuaded of the independence of propylite, I subsequently found reason to doubt it; but to prove a negative is notoriously difficult, and the great authority of my predecessors made the task still more onerous." [2]

Mr. Hague writes, "Recently Mr. George F. Becker, in his work on the Washoe district, made a thorough investigation of the so-called propylite, and as a result denied the independence of the rock-species. . . . We quite agree with him, so far as the non-existence of propylite as a distinct rock-species in the Great Basin is concerned." [3]

Any one who is conversant with the storm Wadsworth's before-mentioned paper of 1879 excited will have no difficulty in understanding why it is that these and some other geologists, who are now standing on almost if not quite identical ground with him, should proceed in such a manner.[4]

M. E. WADSWORTH.

Museum of comparative zoölogy,
Cambridge, Mass., July 21.

Swarming insects.

The editor was slightly unfortunate in his suggestion appended as a note to the letter of Mr. Abbott (*Science*, No. 77). I have just returned from Lakeside, Ottawa county, O., where the phenomenon spoken of by Mr. Abbott was witnessed almost every day for more than two weeks. The pulsating swarms were, beyond question, the 'Canada soldiers,' a species of Ephemera.

During the first ten days of the present month

[1] *Bull. mus. comp. zoöl.*, 1879, v. 285.
[2] Geology of the Comstock lode, 1882, p. 33.
[3] *Amer. journ. sc.*, 1884 (3), xxvii. 454.
[4] See, further, Proceedings of the Boston society of natural history, 1883, xxii. 412-432; and 1881, xxi. 243-274.

this insect swarmed in such numbers as to cover every exposed surface, and literally to darken the air to a height of fifty to seventy-five feet. When the Ephemerae emerge from the water, their flight is weak and uncertain. Instinct teaches them that they are carrying an extra armor, and they seek at once the nearest support as a place on which to moult. At such times these insects are as easily disturbed as a swarm of bees. A gust of wind from an unexpected quarter, giving a slight rustle to the leaves, will often cause them to rise in clouds from each branch. This motion seems a circling one; but the appearance is probably due to the fact that many of the insects are moving back upon the branches, while others are still ascending. No other insects were at all common along the lake during this time. It may be worth placing on record that that venerable citizen known as the oldest inhabitant was speechless in the presence of these swarming millions. His memory could not recall another year in which the numbers were worthy to be compared with those of 1884. It will be impossible to convey in words an adequate conception of this invasion to those who have never witnessed any thing of the kind.

Near the dock at Lakeside there is an electric lamp suspended about twenty feet above the ground. As might be expected, this became an object for attack as soon as the current was turned on in the evening. On the morning of July 7 the layer of dead insects covered an area of not less than twenty-five square feet, and was fully *six inches deep immediately underneath the lamp*. Kelley's Island, four miles distant, appeared all the while as if enveloped in such a cloud of dust as rises over a race-course. On the evening of July 6 a wind compelled the insects to fly very close to the surface of the water, and their numbers appeared fully as great as the snowflakes of a winter's storm. During these ten days the invasion extended along the entire southern shore of the lake, from Buffalo, through Cleveland, Sandusky City, and Toledo, to Detroit. After a rain-storm the water of the lake was dense with them to a depth of at least two feet. Along the beach they were gathered in windrows. As far as my observation goes, fish will not eat the dead insects, but greedily devour living ones. The minnows are very expert at this work, rarely failing to make a capture if the insect has touched the water.

According to Packard, all the Ephmeridae pair while on the upper surface of the water. This is not strictly correct, for any afternoon one could see thousands of couples flying in the air and at elevations as great as fifty feet. When this took place over the water, the couple almost invariably fell into the lake, and was devoured by the fishes. Is nature producing a stronger-winged variety?

EDWARD T. NELSON.

Ohio Wesleyan university,
Delaware, O., July 28.

[The phenomena seen by Professor Nelson, as described by him, appear to be different from those witnessed by Rev. Mr. Abbott, and in all probability a wholly different insect was concerned. The myriads of Ephemeridae mentioned by both writers have been not unfrequently witnessed. A woodcut of a street-lamp in Cleveland, swarming with Ephemeridae, will be found in Morse's 'First book of zoölogy.' We have ourselves seen, from a long distance, windrows of their dead bodies and exuviae along the shore of Lake Winnipeg for very many miles, while the water of the lake was so covered with them that one could not dip up a cup of clear water. — ED.]

Man and the mastodon.

Having had occasion recently to look over numbers of the *American journal of science* of forty years ago, I have met with several notices of archeological interest. Among them is the following, in an article on the suburban geology of Richmond, Wayne county, Ind., by Dr. John T. Plummer, vol. xliv., 1843, p. 302: —

"A tusk [of the mastodon or mammoth] was exhumed from the gravel, fifteen feet below the surface, while excavating the Whitewater Canal, near Brookeville, about thirty miles south of Richmond; [and] a *club-shaped* implement, formed apparently of cliff-limestone, was also taken out of the gravel ten feet below the surface, near the spot where the tusk was found."

This implement is described as "seventeen inches long, rounded at one end, tapering towards the other extremity." I do not remember to have seen any reference to this in recent works; but as Dr. Plummer seems to have been an intelligent observer, and as he calls attention to the resemblance of this implement to an 'Indian hommony pestle,' and to the remarkable fact that it was found under the above conditions, the note should be borne in mind, and other implements looked for in the gravels of the vicinity named.

In the same article are noticed an ornament called ivory by Dr. Plummer, but probably shell, as like mistakes are often made (p. 301), mounds (p. 313), and (on p. 303) "several sticks, and a chip having palpable marks of an edged tool upon it," found nearly thirty feet below the surface in excavating a well in Richmond.

F. W. PUTNAM.

THE MADISON EDUCATIONAL CONVENTION.

THE meeting of the National educational association at Madison, Wis., which closed its sessions on Friday, July 18, was the largest ever held in this country, and probably the largest of its kind in the world. Every state and territory in the Union was represented, and over six thousand teachers were on the ground. The weather was fine, the town beautiful, and very bountiful in its hospitality, the excursions numerous, the speakers eloquent, the exposition, on the whole, more instructive, and in some departments larger, than at Philadelphia in 1876. Everybody was there, was heard, and most who desired it had some office provided for them, and had their names and words spread over the land by the efficient agent of the associated press. Half a dozen meetings were going on at the same time, and manuscript enough to run as many educational journals for the year was evolved; so that those who went will not need to read for one year. There were committee meetings

to fill every hour of the day; and more than once an honest teacher was said to have waked in the morning to find, that, in the small hours of the night before, he had been made president of some new society of which he had never heard. The agents of the railways, with fascinating chromos of attractive scenery, were organizing excursions at fabulously cheap rates for the neighboring lakes, and even for Alaska, whither a large party started the last day. Dignified and super-subtle agents of the many publishing-houses buttonholed every man who could and would help them, with an assiduity in every way worthy the greatest educational show on earth. Superintendents who needed new departures for their constituencies were seeking the support of the convention for all sorts of schemes and reforms. Societies for humanity to animals, temperance clubs, renowned champions of rights for women, Catholicism, represented by a no less adroit and subtle propagandist than M. Capel, were all on hand, and striving by every means in their power to make their cause heard in what all have come to feel to be the centre and source of all influences that are to be permanent and pervading in the land; viz., the public schools. Private, high, normal, industrial, collegiate institutions had meetings of their own more or less numerous. Dr. Graham Bell and the deaf-mutes, Gen. Armstrong and the Indians, Mr. F. Adler and his workshops, the Concord summer school of philosophy, the Quincy reform, were all represented by distinct addresses. An international league was organized, with nearly a score of officers, on the suggestion of an unknown enthusiast at Bonn, Germany; and at the end a very long series of resolutions, expressing the sentiments of a few end men on most of the open questions in the broad sphere of modern life, were approved; and then with fireworks and cannon, and bands of music and illuminations, and out and in door eloquence, the vast assembly dissolved.

This association is not a ring, though its offices and policy are entirely in the hands of a very few men; for its honors are empty, its offices gratuitous, and some of the best educators keep carefully aloof from it. That others are not recognized shows a want of wisdom at the centre, which reveals the weakness and instability of the entire organization. It was never more apparent than at this meeting, that education is, in this country, not a science, nor a profession, in any extended or respectable sense. Contrast the dismal time-killing trivialities which frittered away the time of the larger meetings, the emptiness of some of the addresses, the egotism and ignorance of others, with the method of a meeting of a scientific association.

Worst of all were, perhaps, the dismal hours of the so-called philosophy of education: any thing more stultifying and anti-pedagogic than most of this cannot be imagined. If a teacher can teach, he can interest a convention, or else is sure to have the sense to keep silent. By this test very few *teachers* were heard at Madison. No more earnest and inspiriting address was heard than Col. Parker's, whose iconoclasm the managers greatly fear. He is in earnest in his work; and no man was heard with greater interest, though perhaps rarely without some feeling of strong dissent. It is said, teachers are not in the mood for earnest work at such assemblies. This is often true of the eastern, but not of the western teachers; their enthusiasm is most inspiring, and may shame, as it is rapidly distancing, even the best of the more routine methods of the East. In view of this eagerness, some of the papers admitted by the president were a shame to him, and an insult to the intelligence and zeal of the hearers. There should be, before another meeting, a board of examiners to decide on the merits of papers, less with reference to names, and more to matter.

On the whole, the address of President Bicknell was wise and suggestive and all-sided. His organization of this year shows great administrative capacity, and a clear sense of the needs of the hour. What was wanted this year was mass, quantity, if only to show to outsiders the strength of educational interests. But progress is now so rapid here, that the wants of another year will be very different.

We hope the standard of the new president from the West will be quality first, and quantity afterward. Although in one sense he can hardly equal the success of this year, a higher kind of success desired by those who voted for him is possible. If he has the strength and wisdom to make it against all the solicitations which will tempt him, the most important new departure since the association was founded may be quietly made next year, even by a very small convention, in which quality shall be made the touchstone of all.

A BURROWING SPIDER.

In the somewhat heavy soil of certain fields, where but a scanty herbage thrives, the cave-making spider (Tarantula arenicola, as identified by the Rev. Dr. H. C. McCook) has excavated so many of the nearly perpendicular and cylindrical burrows, that the place is almost honeycombed, and the surface is conspicuously dotted by the irregularly five-sided towers erected above each opening. The burrows vary from one-quarter to three-quarters of an inch in diameter, and in depth from eight to twelve, or even twenty, inches; the smaller being formed, it is said, by the young, which enlarge them with their growth. The walls are compact and smooth, but without lining. Towers in other localities have been observed two inches high: none I have seen are above one inch, the majority being still less.

Among my captives, the most active workers are an adult and a half-grown individual, between whose actions, while digging, slight differences are observable. In a glass jar they refused to do more than attempt to escape by unavailing efforts to scale the sides, but, when set free in the garden, they at once began to exhibit their manner of burrowing, and disposing of the excavated earth. Most of the labor is performed by the large and strong mandibles, with the probable assistance of the fore-legs. A pellet of earth, frequently a third of the worker's cephalothorax in bulk, is loosened as the spider labors head downward, and is seized by the mandibles. The young spider turns at the bottom of the burrow, and ascends, head first, to the edge of the aperture, where the pellet is held just above the surface; then, by a blow from both fore-legs, it is thrown to a distance varying from four to twelve inches, usually falling in particles, so that no fresh earth is noticeable near the burrow-entrance. The half-grown individual then backs down the tube, and resumes work below. The mature spider, while the pit is shallow, ascends backward with the load, comes entirely out of the orifice, turns around, and, having popped the abdomen into the opening, throws away the pellet. She rests for a few moments, again turns within the cave, and descends, head foremost. Before returning to work below, however, she often carefully examines the edges of the burrow-entrance, and, if the earth has become dry and friable, strengthens it by threads of web, applied by longitudinal strokes of the spinnerets; and, if her movements have broken down the margins, she places her head under the edge, pushing and lifting the earth in a way suggestive of a dog's method of heaping dirt on a bone with his nose. She then applies more web, and resumes her digging. But, as the burrow deepens, the mature spider also turns while below. I have, however, never observed a young individual bring up a pellet backward.

That the spinnerets of this species take any part in pellet-making is improbable. Mrs. Mary Treat, while studying Tarantula turricula, observed their application to the earth-mass before its ejection. It is likely that Tarantula arenicola relies solely on the cohesion of the moist particles, without the addition of strengthening web, as I have repeatedly witnessed the dry soil of the field crumble to sand before the spider could get the pellet quite out of the tube.

The young specimen brought up a load at intervals varying from two to five minutes; and a cavern half an inch across and about one inch deep was excavated in an hour and a half. While deepening a burrow, a young spider in the field worked somewhat faster. Assuming a pit to be of the uniform width of three-quarters of an inch and twelve inches deep, the Tarantula must carry out the comparatively enormous amount of 5.31 cubic inches of earth.

The towers are usually composed of short pieces of grass (fig. 1) placed above and across each other in an irregularly five-sided wall. Occasionally small twigs are used. Indeed, almost any light object will be utilized if within reach, for the spider will not leave the burrow to search for materials. If nothing is attainable without such an effort, she will erect a low wall of earth. In several instances towers have been destroyed, and the ground cleared for a space of three inches radius; and from another place the sod was removed: but, in

every case, the spiders raised a bulwark of earth, one having attached a single sliver of pine shaving, the only thing within her reach. At times the grass is curved around the opening, as if a wisp had been taken, and the tower formed at almost a single stroke, without the labor involved in placing each blade separately. Near the favorite field, a housewife, in the annual frenzy of house-cleaning, had thrown out a quantity of coarse straw, which some of the Tarantulas utilized by erecting towers (fig. 2) of comparatively immense straw logs. Two miles from the latter was found a lofty edifice (fig. 3) built of large pieces of brown, partially decayed wood from an old railroad tie. Mrs. Treat has witnessed their construction by another species. I have not observed the entire process.

FIG. 1.

The spiders' favorite position is a crouching one at the summit, the legs within the tower, and supported by the walls. At the sight of any approaching object, they dart backward into the burrow. They are not disturbed by surface vibrations. Footsteps, even the passage of a heavy wagon within five yards of the pit, do not affect them; but the slightest movement of the observer, two feet distant, or the sudden swaying of a bush, sends them to the burrow immediately. Dr. H. C. McCook, writing in a popular magazine, says of the use of these erections, that "they probably serve as watch-towers, from which the keeper may observe the approach of her enemies," as an attraction to roving insects, and perhaps to prevent flooding of the cavern by rain. The towers in this locality are far from being waterproof: they are used exclusively, I think, to facilitate the capture of food. But observers, so far as I am aware, have made no statements as to the method of food-capture, when the food fails to voluntarily scale the walls.

The towers are observatories and transmitters of signals to the spider when below. From them she scans the field, as the robber barons of the olden time, from their battlements, watched for the coming of the caravan. The spider peers through the scanty grass-blades, selects her victim, and, as I have witnessed, leaps from the summit to seize the prey. I have seen her spring at a fly on the ground, missing it, of course. But she does not always wait for food until the pit and tower are completed. I have seen her dart from the edge of an unfinished burrow, capture an ant three inches distant, and retire to the shallow cave. Ten minutes later she re-appeared empty-handed, and almost immediately attempted to seize another near by, but failed to do more by her frantic efforts than scrape up a heap of loose earth.

The towers are so loosely constructed that an ant can scarcely run over the walls without making enough rattling to admonish the concealed spider, which at once hurries to the top, and, if the insect is acceptable, takes it in. A black ant running over the foundations almost invariably brings the spider up; and the gentle tapping of a straw, or even dragging a straw across the dead grass in contact with the walls, is quite sure to be followed by the arachnid's appearance. The sense of direction, or the ability to perceive whence the disturbance proceeds, is well developed. The spider always ascends on that side to which the straw is applied, and the same individual

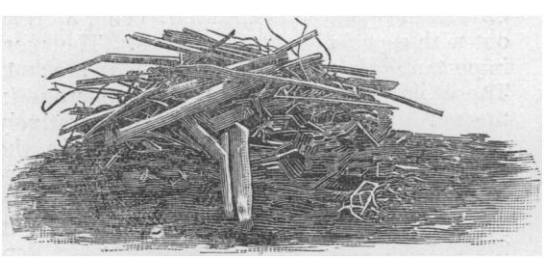


FIG. 2.

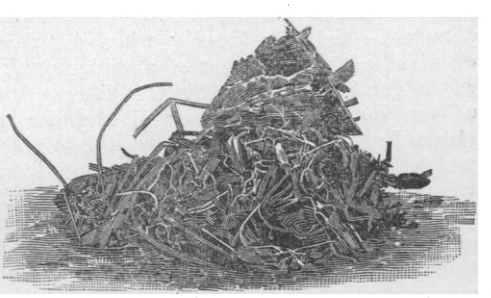


FIG. 3.

can be brought to each side in succession. The depth of the cavern seems to have little effect. I have called up the occupant from a burrow which subsequent examination has proved to be eighteen inches deep. Unless she has been deceived several times, she usually runs up rapidly, and will occasionally snap at the end of the straw. While experimenting, it is hardly possible to avoid introducing fragments of the tower, or adherent particles of earth, and it occurred to me that these might be the call to which the spider responded; but sand from an ant-hill, sprinkled in freely, had no effect.

Mrs. Mary Treat, writing of another species of Tarantula, says that all food-remains were ejected in the same way as the earth pellets. Tarantula arenicola is not so neat. The earth beneath old burrows is often darker than the walls, and densely filled with fine rootlets. It is probably darkened and enriched by the spider's excrement and food-remains. From burrows in the field it is the rule to take masses of *débris*, which consist of the spider's exuviae, the heads and legs of ants, the elytra and other chitinous parts of beetles, with fragments of insect-wings. It seems that the dead and empty bodies are torn to pieces, and scattered at the bottom. This was done by a captive which would not dig, but which accepted maimed flies. After extracting the juices, the spider tore the body into fragments so small that only careful search could find them. In but two instances have I observed an ejection of food-remains. A mutilated fly was seized from a tower, and twenty-four hours later I did find what appeared to be the desiccated remains. In the second case, two spiders were fighting fiercely when set free at evening, near the burrow of a small specimen in the garden. During the night the occupant of the burrow was dislodged, and the vanquished spider had been dragged into the pit which the conqueror had enlarged, and whence, in the course of the morning, fragments of the dead body were thrown out, among them the abdomen severed from the thorax, but not otherwise mutilated. Occasionally, also, an elytron can be found near a tower in the field.

This disposition of remnants is somewhat remarkable; since spiders in general are cleanly, and since this one is particularly intolerant of intrusive objects. A straw or stem dropped into the burrow is immediately carried up, and tossed away. The only instance observed, where a young spider ascended backward, was when trying to get a heavy stick out of the pit: having lifted in vain, she attempted to pull.

Noticing the fondness for ants, a number of bran-cracker crumbs were sprinkled at a distance of six inches from the tower, and an ant was soon struggling under a load larger than itself. Suddenly the spider on the tower started, erect and rigid: she leaped to the ground, she ran six inches, she seized that bit of cracker, and retreated with it to her burrow, leaving the emmet on its back in the dust. For two hours she remained below. The following day I twice witnessed the same performance. The spider once overran the crumb, and so lost it. At the third time, the piece of biscuit became wedged in the tower as the spider was running in backward, and I plainly saw her nibbling at it. During a momentary absence for forceps to remove it, to examine for marks of mandibles, the spider carried it down and out of sight. The fragments were not touched, except as they were being borne about by the ants. Is it usual for spiders to take any but animal food?

Dr. Alfred C. Stokes.

THE EXPLORING VOYAGE OF THE CHALLENGER.

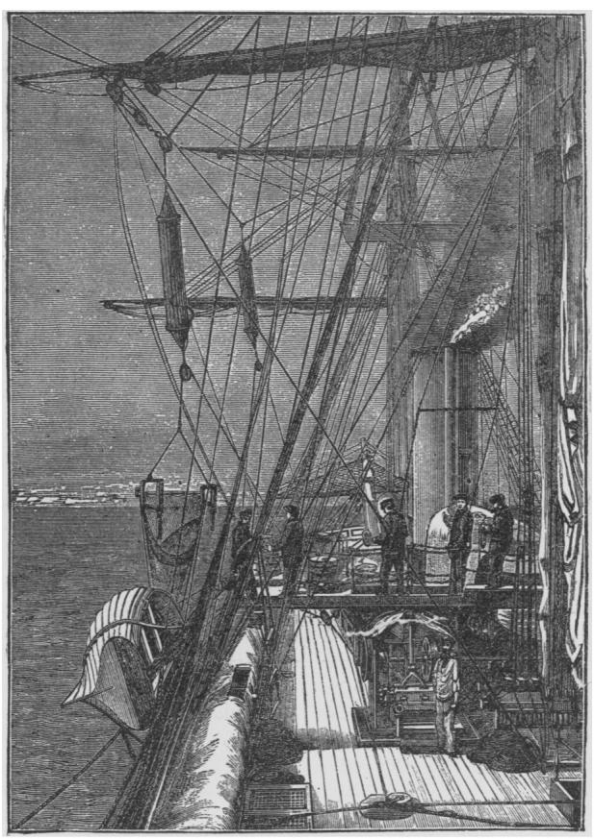
(Second Notice.)[1]

Professor Herdman has published the first part of his memoir upon the Tunicata (vol. vi., 296 p., 37 pl.), which treats solely of the 'Ascidiae simplices,' the composite and pelagic forms being reserved for future consideration. From the historical preface to the index, this report is a model of systematic arrangement; the bibliography, and the chapter on anatomy and classification, being worked out with especially elaborate care. The most important generalizations reached are: 1. These simple ascidians are not numerous in the northern hemispheres, are comparatively scarce in tropical latitudes, and attain the greatest abundance in southern temperate regions; 2. Although simple ascidians occur in very deep water, and are fairly represented in the abyssal zone, they are chiefly a shallow-water group, and are most numerous around coasts in a few fathoms of water; 3. The occurrence of simple ascidians does not depend upon temperature or character of bottom. The discussion of questions affecting the Tunicata as a class is reserved for the second part of the report. The phylogenetic table on p. 286 is of great interest.

[1] See No. 66.

There still remain to be published a number of reports upon Mollusca, — Huxley on the cephalopods, Boog Watson on the gasteropods, E. A. Craven on the pteropods and heteropods, Rudolph Bergh on the nudibranchiates, E. A. Smith on the lamellibranchiates, and Busk on the Polyzoa; the first instalment of the latter paper being announced for the next volume.

In his report upon the Brachiopoda (vol. i., 67 p., 4 pl.; also *Proc. royal soc.*, xxvii. p. 428), Professor Thomas Davidson of Brighton discusses the 31 species and varieties obtained, and presents a catalogue of the recent species at present known. Although the dredge was put down at 361 stations, brachiopods were found only thirty-nine times. The greater bulk of known species live at comparatively moderate depths, few as deep as 500 fathoms, and are specifically rare from 500 to 2,900 fathoms. It is also shown that the same species is capable of existing at different depths, without any observable modification in shape and character. Frequent allusions are made to the American authorities Dall and Morse, the opinions of the former being referred to on almost every page.



THE DREDGING AND SOUNDING APPARATUS ON BOARD THE CHALLENGER. (Copied from *The Atlantic.*)

Dr. F. Buchanan White, in his Report on the pelagic Hemiptera (vol. vii., 82 p., 3 pl.), discusses the interesting oceanic insects belonging to the genera Halobates and Halobatodes. He concludes that the region between the eastern part of the Indian Ocean and the West Pacific is the birthplace of the genus Halobates, whence it has spread to other parts of the world, Halobatodes being one of its derivatives.

The monograph of the anatomy of Peripatus, begun by the late Professor Balfour, has already been published under the editorship of Moseley and Sedgwick, the latter of whom is now continuing the subject by the use of material collected by himself at the Cape of Good Hope last summer. It is questionable, therefore, whether this will form part of the Challenger series.

Dr. P. P. C. Hoek of Leyden has printed his report upon the Pycnogonida (vol. iii., 167 p., 21 pl.), which, in addition to discussing the 41 species dredged by the Challenger and the Knight Errant, 33 of which were new, contains a critical review of the genera and species, 129 in number already known to science, in which frequent complimentary references are made to the work of our countryman, E. B. Wilson, upon the same group. The most important generalizations obtained are: 1. That those genera which range most widely geographically are also those which range most widely in depth; 2. That, though there are deep-sea species, deep-sea genera do not appear to exist. The author admits his inability to show any definite influence of deep-water habitat upon the form and structure of the animals under consideration.

Dr. Hoek's report on the Cirripedia (vol. viii., 189 p., 13 pl.) appears to be a very carefully executed and scholarly essay. Its usefulness is greatly enhanced by a well-made index, and an introduction in which the history of the group, and its literature since the

publication of Darwin's monographs, are carefully and critically summarized. Darwin knew 147 species of cirripeds; 18 were added by his successors; while, in the present report, 59 are described, together with 1 new generic type; 78 species, in all, having been collected. The percentage of new material in this group was therefore unusually great.

Out of 34 genera known, 28 have never been observed at a depth greater than 150 fathoms. It is shown that there are no deep-sea genera; for, even of the two genera ranging lowest in depth, species are known from shallow water. Dr. Hoek's discussion of these two genera, in which he shows that their occurrence in great depths coincides in a striking manner with their paleontological history, is very suggestive; as is also his statement, that, in the case of Scalpellum, the deep-sea rather than the shallow-water forms have preserved the character of the oldest fossil species of the genus, while, in the case of Pollicipes, the more archaic types are found in shallow water. The author also points out the fact, that, while the deep-sea genera have a world-wide range, the deep-sea species ordinarily have only a very limited distribution.

A most laborious paper is that upon the Ostracoda (vol. i., 184 p., 43 pl.), by Prof. G. Stewardson Brady of Sunderland, with its almost endless array of figures, at least 2,000 in number. The paper is almost entirely descriptive; families, genera, and species, old as well as new, being fully characterized. Out of the 220 species obtained, 143 were new; and only 15 of the entire number catalogued owe their names to other authority than the author. The deductions concerning geographical distribution are, of course, very interesting. It is shown that Ostracoda occur very sparingly in the oceanic abysses: only 19 species were found at depths below 1,500 fathoms, and only 52 below 500. The materials for a study of the horizontal distribution of the group were not very extensive; and it is evident that there is still an immense amount to be done in the study of Ostracoda in all parts of the world, particularly in the shallow waters, which the Challenger rarely touched.

The report upon the Copepoda, by the same author (vol. viii., 142 p., 55 pl.), is also purely descriptive: 106 species are enumerated, of which 47 are described as new, 10 new generic types being defined. It is an interesting evidence of the exhaustive character of Dana's work while connected with the Wilkes exploring expedition, to note, that, out of the 90 species of free-swimming Copepoda collected, 30 were described by him, and that sixty per cent of the previously described forms in the list bear his name. Professor Brady's drawings and descriptions are admirably executed. The lack of an index to text and plates is, however, much to be regretted. The Challenger Copepoda were almost without exception obtained by surface towing. The only undoubted deep-sea species was Pontostratiotes abyssicola, of which a single specimen was obtained at 2,200 fathoms.

Many of the reports on crustaceans are yet to appear, — discussions of the brachyurans, by E. J. Miers; the anomurans, by Professor Jules Barrois, director of the zoölogical laboratory at Villefranche; the macrurans, by C. Spence Bate; the Amphipoda, by the Rev. T. R. R. Stebbing; and the Cumacea, Schizopoda, Stomatopoda, and Isopoda, by authorities not yet named.

Nothing whatever has been printed upon the Vermes as yet. The annelids are in the hands of Dr. W. C. McIntosh. Professor Ray Lankester has the gephyreans; and Dr. Ludwig Graff, the Myzostomidae. The assignment of the Chaetognatha to Dr. Oscar Hertwig was announced in 1880; but this group has been omitted in later lists — without explanation, however, and it is to be hoped unintentionally.

The report upon the Holothurioidea, by Dr. Hjalmar Théel of Upsala (vol. iv., 176 p., 46 pl.), is one of the most interesting of the special descriptive papers; since the deep-sea holothurians are shown to constitute a group by themselves, specially characteristic of the abyssal fauna, and very different from the littoral forms hitherto known. This group, which is placed by the author in a new order, Elasipoda, is believed by him to have in certain respects attained a higher development than all the other echinoderms, — "a development which is gradually approaching the higher classes of animals." Previous to the publication of this report, only three animals of this group were known; these having been brought in by the Swedish and Norwegian dredging expeditions of 1875, 1876, and 1878. There are here described 52 species and 3 varieties, distributed into 19 genera. Of this entire number, only 4 are found at depths less than 500 fathoms, as many more from 500 to 1,000, the remainder from 1,000 to 2,900 fathoms. "Thus we learn that the Elasipoda abound over the floor of the ocean at great depths, and that the number of species and of individuals is greatly reduced shorewards."

G. BROWN GOODE.

THE CENSUS REPORT OF 1880.

IT is now the middle of 1884, — four years since the date of the last census of the United States; yet the volumes of that census are not all published by the government. Eight volumes have appeared, besides the bulletins issued during the years 1881 and 1882: viz., two of the 'Compendium,' containing 1,850 octavo pages, and published early in 1883; and six of the quarto volumes, containing from 850 to 1,300 pages each, in which are given the more extended tabulations, and the general treatises on population, agriculture, manufactures, transportation, cotton-production, etc. The number of these quarto volumes is not positively stated by the census officials, but will probably be twenty. We may consider the first six, however (of which the first four came out in 1883, and the other two in 1884), without waiting until the series is complete, which may not be until two years hence. The important volume, which is to contain the 'social statistics' of pauperism, insanity, crime, etc., is not yet in the printers' hands; and the tables and general treatises on these topics are still subject to alteration by those who are editing them. The same is true of the mortality statistics and many others; and so liable is the work of editing these tables to be delayed, that it is quite impossible now to say when the final volume will appear.

There are two ways of looking at a great statistical work of this sort, intended to show the economic and social relations of fifty millions of people, scattered over millions of square miles, in every form of civilization and every mode of living. One way is to consider what has been done to exhibit these statistics, and to be thankful for that; which must, of necessity, be an immense labor, and exposed to many minor inaccuracies. The other way is to set up a standard of performance in work of this kind, and to criticise what falls short of this standard. The latter would be the true method, if statistical science had yet advanced far enough to enable so great a census as ours was in 1880 to be taken with accuracy, and reported by persons who understand what they are to do, and how to do it in the same thorough manner in which trained investigators in some special science proceed. But there is as yet no example of census-work done in this manner, and we must not look for it in the work before us. A certain degree of accuracy has been attained, though less, we believe, in most instances, than the specialists at the head of each branch of inquiry suppose. But the explanations and cautions and qualifications which they put forth in each of these census volumes, in regard to the tabulations that present their particular topic, will soon convince the casual reader that he must use these statistics with much circumspection, or they will lead him astray There is hardly a point, for example, on which the more elaborate work of this tenth census does not bring out the faults and defects of the earlier ones, and show that even the last preceding census, that of 1870, which was taken under the same superintendent (President Walker of the Institute of technology), was grossly and amusingly wrong in important particulars.

It is therefore evident at once, that to compare the results in 1880 with those in 1870, 1860, etc., in order to exhibit the growth of the United States, is only possible in a few general respects, if any reasonable exactness in the comparison is insisted upon. Sometimes this comes from the nature of things, and not always from the errors of the enumerators or tabulators in previous decades. For example: the value of the dollar (by which all products, debts, revenues, property, etc., are measured) was so different in 1870 from what it had been in 1860, and again from what it became in 1880, that it is not possible to make these pecuniary comparisons without great risk of mistake. To take the premium on gold in 1870 as the measure of depreciation for our currency, though this is all we can do, is well known, by those who noted prices and values then as compared with ten years before or since, to be extremely fallacious. The rubber yardstick of the imaginary tradesman, which was sometimes four feet long and sometimes only two, is a fair type of the fluctuating and elastic currency by which we have had to measure values since the civil war.

But the fallibility of the men who make up the census schedules, who take the count of men, animals, crops, acres, houses, farms, mills, etc., is the chief source of inaccuracy in any census. It is not possible to foresee exactly what questions ought to be asked, or where to draw the line between attainable and inaccessible facts. The questioner may defeat his own purpose, not only by the form, but by the multiplicity, of his requirements. Nature quickly sets a limit to the power of answering the census inquiries accurately in case of the average citizen or his wife. To go beyond that limit is to invite error and blunder, as the expert tabulator of the answers well knows: he therefore undertakes by his tabulation to amend the defects of the return. But this, also,

is only possible to a limited extent; and the enlightened efforts of the expert may end in aggravating the blunders of the enumerator. His own opinion or prejudice may come in, and so warp the poor facts already twisted out of shape by the clumsy reporter of them, that they finally bear no likeness to the situation they ought to portray. A permanent statistical bureau, collecting its facts from year to year, and correcting the mistakes of one year by the better information of the next, is far less likely to err in this respect than an organization which works, like our national census bureau, only at intervals of ten years. Though the latter may, and of late years does, extend its labors well over the whole period from one ten-years' point to another, it still lacks the useful correction which annual returns inevitably supply.

All things considered, the eight volumes before us are excellent, and indicate that the whole series, when completed, will far surpass, not only the work of any previous decade in this country, but the published results of any similar census in the world. The plan of President Walker was an ambitious one, his selection of experts and subordinates was mainly good, and the time allowed for them to complete their tasks has been ample. Unfortunately, the cost of so great an enterprise was not well understood; and the needful appropriations of money have not been made, or have been so delayed as to impede the work. The undertaking also suffered from its own vastness, and much of that which was hoped for was found unattainable. The important subject of pauperism, for example, — the correlative to our unexampled growth in material wealth, — receives inadequate treatment in the 'Compendium,' and cannot be so exhibited in the quarto volume as to do it justice. Mr. Wines, who has charge of this topic, has given up in despair the effort to collect statistics of out-door relief, and only reports on the almshouse expenditure, and number of inmates. This is, in fact, to omit more than half the material belonging to the subject, and that portion, too, which best exhibits the growth of pauperism from year to year. In other divisions of the work a similar class of omissions may occur, in consequence of which the results will appear in some respects more defective than those of the last census. But in fact, and on the whole, they are much more complete; and the volumes now issued, with those which are to appear, will furnish material to economic and scientific students for years to come. The more they use them, the better will they appreciate the foresight, labor, and research of the men who compiled them, although they will also perceive more clearly how defective the most perfect statistics are foreordained to be.

GEOLOGY OF THE SUSQUEHANNA RIVER REGION.

Second geological survey of Pennsylvania: report of progress G⁷. The geology of the Susquehanna River region in the six counties of Wyoming, Lackawanna, Luzerne, Columbia, Montour, and Northumberland. By I. C. WHITE. With a colored geological map in two sheets, and 31 page plates in the text. Harrisburg, 1883. 30 + 464 p. 8°.

THE region to which this report relates embraces nearly two thousand square miles of the Devonian and Silurian rocks lying north and west of the great anthracite-coal basins, along the north branch of the Susquehanna River. Although there are some small outliers of the true coal-measures in this district, Professor White has referred to these only incidentally; his report beginning at the base of the Pottsville conglomerate (millstone grit) No. xii., and extending down to the oldest formation exposed, which is the Medina No. iv.

The volume begins with a long prefatory letter by Professor Lesley, director of the survey. This is essentially a somewhat critical summary of the more interesting features of Professor White's report, which embraces two distinct portions; the first third of the volume being a comprehensive account of the geology of the entire district, and comprising nearly every thing of general interest, while the remainder of the work is devoted to a detailed report by townships on each of the six counties.

A brief account of the drainage and topography is followed by a description of the interesting glacial phenomena. The great terminal moraine crosses Carbon, Luzerne, and Columbia counties in a general north-westerly direction, dividing the region into a north-east glaciated portion and a south-west unglaciated portion. Back of the moraine is the mantle of unmodified drift, derived entirely from the local rocks. In front of the moraine, or to the south and west, the whole country is covered, up to a height of seven hundred and fifty to eight hundred feet above tide, with a stratified deposit of modified drift. According to Professor White, this deposit was spread by the gigantic rivers resulting from the melting of the ice-sheet; but Professor Lesley finds it necessary to suppose a subsidence of the land,

that permitted the sea to wash the terminal moraine, and cover all points less than eight hundred or a thousand feet above tide. Out of the modified and unmodified drift the modern rivers have carved their channels, leaving a series of well-marked terraces, the highest of which are now two hundred feet above the streams.

But in the northern or Wilkes-Barre coal-basin, the Susquehanna and its tributaries are still fifty to a hundred and eighty-five feet above their pre-glacial beds for a distance of at least twenty-five miles; and these buried valleys are of unusual interest, because at Bloomsburg, Sunbury, and Selinsgrove, points on the Susquehanna thirty to seventy miles below Wilkes-Barre, the rocky bed of the river is a hundred and ten, ninety, and seventy feet respectively higher than the buried channel at Wilkes-Barre.

The geological structure of this district is typically Appalachian, a north-west and south-east section including ten principal overlapping flexures of the strata, and the synclinals holding the anthracite-coal fields.

Professor White believes there is a transition series between the Pocono sandstone No. x. and the Catskill No. ix., and another between the Catskill and the Chemung No. viii.

The paleontology of this report presents several striking anomalies; various Devonian and Silurian types, including some of those regarded as most characteristic of their respective horizons, occurring here in associations, and following each other vertically, in an order unknown elsewhere. Professor Lesley suggests that this apparent confusion may be due, in part, to incorrect determinations of the forms. But some of the confusion is real; for Halysytes catenulata, a coral which no one could mistake, occurs very abundantly at one locality in the Stormville limestone, which belongs near the middle of the lower Helderberg, although this form was never before found above the Niagara.

Like most of the Pennsylvania reports, this volume is abundantly indexed; there being six different indexes, covering fifty-four pages.

NOTES AND NEWS.

A SHORT time since, we referred to the call of the Peabody museum of American archaeology for funds to enable the museum to continue its important and thorough explorations in Ohio. So far the work has been continued without interruption, thanks to the persons whose subscriptions are here acknowledged: Mr. John C. Phillips, Boston, $200; Hon. Stephen Salisbury, Worcester, $100; Hon. Robert C. Winthrop, Boston, $50; Mr. H. A. Homes, Albany, N.Y., $5; Mr. A. H. Thompson, Topeka, Kan., $5; Mr. A. E. Douglass, New York, N.Y., $47; Mr. William B. Weedon, Providence, R.I., $50; Mrs. Esther Herrman, New York, N.Y., $50: total, $507.

— The French association for the advancement of science has appointed two delegates to attend the Philadelphia meeting of the American association, — Professor Joubert, professor of physics, and general secretary of the French society of physics; Professor Silva, professor of chemistry at the Municipal school of physics and industrial chemistry. This is of interest as promoting the formation of an international association.

— Before the section of economic science and statistics of the American association, papers are announced on the following subjects: A study of cotton fibres, their value, etc., illustrated by photo-micrographs; The economics in deaf-mute instruction; Explanation of instruments used to determine the power to move trains, and also of instruments for the inspection of railroad-tracks; The apprenticeship question and industrial schools; The value of photo-micrographs of wood-fibres, illustrated with sections of thirty different woods; The use of graphics in statistics; Exhibitions, national and international, considered as economic forces; Theory and economy of the American system of patents; The allotment of lands to Indians, illustrated by experience with the Omaha tribes; The public and the professions, 1870–80; Statistics and organization of the classified public service in the United States; Some general results of the census of crime and misfortune in the United States; The economic element in the problem of manual training. (Several papers are expected on important topics.)

— We are informed by a private letter that three of the younger mathematicians of Germany, all men of mark, are expecting to attend the meeting of the British association in Montreal, and are planning afterwards to visit the United States. Reference is made to Messrs. Lindemann of Königsberg, Dyck of Munich, and Wedekind of Carlsruhe, all of them professors ordinarii in their respective places.

— *Nature* states, that, at the request of the council of the British association, Admiral Sir Erasmus Ommanney, C.B., F.R.S., has consented to act as treasurer during the meeting at Montreal, Canada. It further announces that Prof. W. G. Adams of King's college will be unable to give the Friday evening lecture at Montreal, and that Prof. O. J. Lodge will take his place. The subject of Professor Lodge's lecture will be 'Dust.'

— The Seth Thomas clock-company has undertaken, under the advice and guidance of Dr. L. Waldo, the construction of clocks of a high grade of excellence for scientific purposes, which they propose to call clocks of precision. They have already made considerable progress as to the best form of pendulum suspension, and dimensions of the steel-jar mercurial pendulum (which is filled *in vacuo* by a new

process): and, as soon as the small physical laboratory they are now building for this purpose is completed, they propose to investigate some of the questions which make good clock-making such a difficult art; such as, the permanency of length of pendulum-rods of various materials, the effect of air mechanically contained in the ordinary mercurial pendulums, the effect of mercuric oxide and other impurities of the mercury, and the effect of temperature changes on various forms of pendulum suspension.

This is another instance of the tendency shown by American artisans to avail themselves of the most recent knowledge to be derived from scientific research. Some time since, we noticed that the Pratt & Whitney company of Hartford were spending many thousands of dollars in their efforts to produce screws and other measuring-engines which would accurately correspond to the established yard and metre. In this work they availed themselves of the assistance of Professor Rogers of Cambridge; and the results they attained must be gratifying to every student of physical science interested in having accurate screws and gauges for use independently, or in connection with other pieces of apparatus.

— The efforts of the committee of the Franklin institute to secure a valuable collection of books on electricity for the electrical exhibition are meeting with considerable success. Already the collection numbers about three thousand titles, and is constantly increasing. As is well known, the Pennsylvania railroad company has placed its old passenger-station at the disposal of the managers of the exhibition to furnish additional space.

— The Chesapeake zoölogical laboratory, which is the name under which the marine zoölogical station of the Johns Hopkins university has been maintained during the last six years, is stationed this year at Beaufort, N.C., — a site which has been proved during three previous seasons, from 1880 to 1882, to be most favorable for zoölogical researches. Dr. W. K. Brooks, the director of the laboratory, has been prevented by long-continued ill health from assuming his usual responsibilities, though he has hoped to join the party for a time. His place as chief of the party has been taken for the season, at the request of the university, by H. W. Conn, Ph.D., who received not long ago one of the Walker prizes from the Boston society of natural history, and who has recently been appointed to a position in the Wesleyan university at Middletown. Besides Dr. Conn, there are nine investigators at work; among them, W. Bateson of St. John's college (Cambridge, Eng.), H. H. Donaldson (A.B., Yale), E. A. Andrews (A.B., Yale), I. Nelson (S.B., Univ. Wisc.), H. L. Osborn (A.B., Wesl.), and H. F. Nachtrieb (S.B., Univ. Minn.). Others were expected to join the company. Private letters from Beaufort give indications that the summer's work will be fruitful in good results.

— The Greely relief squadron, with the survivors on board, arrived at Portsmouth on Friday, Aug. 1, and a reception with a grand parade was given to them Monday, Aug. 4. The remains of those who perished have been sent to New York for burial.

— North-western North America contains so many different linguistic stocks, and these are split up into such a large number of languages and dialects, that any contribution to the supply of vocabularies from this region is important. A pamphlet of a hundred and twenty-seven pages, just issued by the geological survey of Canada, contains vocabularies of "one or more dialects of every Indian language spoken on the Pacific slope from the Columbia River north to the Chilkat River, and beyond, in Alaska, and from the outermost seaboard to the main continental divide in the Rocky Mountains," and is therefore a most welcome addition to the working-material of the linguistic scholar. The vocabularies result from the joint labors of Messrs. N. Fraser Tolmie and George M. Dawson, whose names are a sufficient guaranty for the general accuracy of the work. The vocabularies number more than thirty, and are classed by the authors under no fewer than fourteen distinct stocks, — a number which it is probable will require to be reduced. Few scholars, at least, will be willing to admit Tsheheilis as a stock distinct from Selish, of which latter it is usually considered to be the westernmost division, nor to consider Bilhoola, Kawitshin, and Niskwalli distinct from Selish. The value of the volume is greatly enhanced by a map colored to show the distribution of the Indian tribes of British Columbia. The linguistic stocks, the distribution of which within the above area is shown, are the Tlinkit, Tshimsian, Haida, Tinnē, Kwakiol, Bilhoola, Aht, Kawitshin, Niskwalli or Skwalliamish, Selish, and Kootennha. The work is a substantial addition to the linguistic history of the area to which it pertains.

— The bibliography of Ptolemy's geography, which Mr. Justin Winsor has been printing by instalments in the Harvard university *Bulletin*, has been issued separately, in advance of its completion in the *Bulletin*, and forms an interesting contribution (forty-two pages) to historical geography. It is particularly valuable for the information it gives regarding the early cartography of America, and the ante-Columbian views of the ocean west of Europe. Much collateral matter serves to elucidate the subject. The name 'America' appears for the first time on a Ptolemaic map in 1522; but reasons are given for believing that it occurred in print or in manuscript as early as 1513–15. It appears that copies of the 1478 edition have been sold at eighty, ninety, and a hundred pounds.

— According to *Nature*, Pasteur's experiments with the virus of hydrophobia are going on with unbroken success. He has thus far experimented on fifty-seven dogs, — nineteen of them mad, and thirty-eight bitten by them under uniform conditions. Out of these thirty-eight, half had been previously inoculated, the other half not. The latter, without a single exception, died with unmistakable signs of hydrophobia, whereas the nineteen others are about, and as well as ever. They will be watched for a year by veterinary doctors to see whether the inoculation holds good permanently or only temporarily.

— A meeting was held on July 1, in the lecture-

room of the British museum, for the purpose of conferring as to the advisability of adopting the method of trinomial nomenclature now coming into use among American zoölogists. The meeting was held on the occasion of the visit to England of Dr. Elliott Coues, a prominent advocate of the system in the United States. Dr. R. Bowdler Sharpe read a paper on a series of sub-species of goshawk, differing slightly in character, and coming from South Africa, Senegambia, Turkey, Asia Minor, India, Ceylon, and Burmah. Other cases he cited were those of Corone, in which the species differ only in size. These cases inclined Mr. Sharpe to view Dr. Coues's proposals with favor. He was followed by Mr. Seebohm, who stated his belief that the present system of binomial nomenclature had retarded our recognition of the fact of the existence of sub-species. Selecting the forms of nut-hatches, he illustrated the method by which he would convert Dr. Coues's empirical into a more logical system. Dr. Coues was very heartily received. He said he recognized that nomenclature was a necessary evil. Since the establishment of the binomial system by Linné, there had been an absolute revolution in our ideas of what species were. "We now recognize that there are no such things as species, and that forms are so intimately related, that, did we know all, there would be an unbroken series;" and Dr. Coues instanced the American woodpecker in proof of this. Other speakers followed; the main objections to the new system being the fear of endless introduction of new names, and the temptation to those who already refined too much. In summing up, Professor Flower said that some fresh system of nomenclature would be inevitable, but what system remained to be seen.

— The distinguished mathematician, Dr. George Salmon, regius professor of divinity in Trinity college, Dublin, has been elected a corresponding member of the Académie des sciences, Institut de France, to succeed Dr. William Spottiswoode, the late president of the Royal society.

— *Nature* announces the death of the venerable Abbé Moigno at the age of eighty-one years. The name of the abbé has been long known in connection with French science, and more especially as the founder, and till quite recently the editor, of *Les mondes.*

— The State natural-history society of Illinois held its annual meeting at Peoria, at the National hotel, commencing July 7. Among the papers presented were the following: The president's address, Dr. Julius S. Taylor; Illinois forestry, T. J. Burrill; Developments in the Streator coal-field, Edwin Evans; Mastodon and other remains of the loess and drift clays, and their relation to the climatology and geology of the deposits, Dakota mounds, Ancient pictographic records on the rocks in the vicinity of the Missouri River, Experiments with a copper-head serpent, William McAdams; Marine algae, Rise of sap in trees, Corn fungi, A. B. Seymour; Silk-culture, J. E. Armstrong; Phytoptus galls on the leaves of Nyssa multiflora, H. Garman; Artificial production and propagation of insect diseases, S. A. Forbes; Location of sound by the ear, J. B. Taylor; Life-history of Prionyxystus robiniae Peck, Parasites of Apatura clyton, Preliminary stages of Papilio cresphontes, A. H. Mundt; Higher cryptogams, Mrs. Dr. Griffith; Instruction in zoölogy, B. P. Colton; Zoölogy in country schools, F. A. Houghton; Introduction of fishes into new waters by natural means, D. B. Wier; Embryology of the buccal mucous membrane, Will X. Sudduth.

— At the March meeting of the Royal astronomical society, Dr. David Gill, her majesty's astronomer at the Cape, stated that he had prepared a scheme for the investigation of the parallax of stars, but that the carrying it out, in so far as the southern hemisphere was concerned, depended on the generosity of the lords commissioners of the admiralty in providing him with a heliometer necessary for the purpose. On the 13th of June he had an interview with the authorities of her majesty's treasury, and was permitted to state to the society, at its meeting on the evening of the same day, that they would not be wanting in the necessary generosity. It will be remembered that the co-operation of Dr. Elkin, working with the large heliometer of the Yale college observatory, is included in this plan.

— The first De Morgan memorial medal has been awarded by the London mathematical society to Professor Arthur Cayley, for his contributions to the modern higher algebra and other branches of mathematics. The presentation of the medal will take place at the annual meeting of the society, in November next.

— The way of connecting electric-light circuits, which is represented in fig. 1, has been introduced by

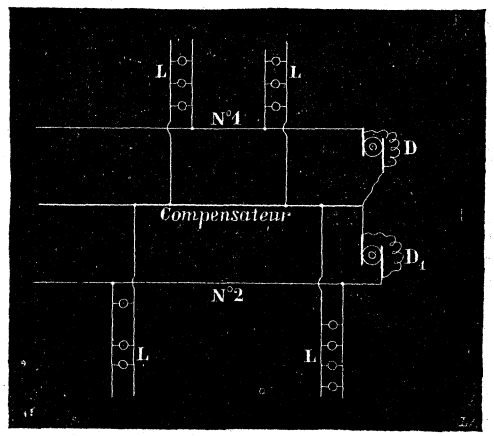


FIG. 1.

Dr. Hopkinson and Mr. Edison. Two dynamos, *D*, *D*, are connected in series to the principal lines, No. 1 and No. 2; and a third conductor, called the 'compensator,' is introduced to serve as the return circuit. The lamps *L* and *L* are placed between the main lines and the compensating line. It is claimed that this arrangement diminishes the weight of copper

necessary in the wires by sixty per cent; but this figure is probably too high. If the electromotive force of the dynamo is too high for the lamps, a third wire between the two principal conductors may be used, and the lamps inserted between this and the two principal conductors.

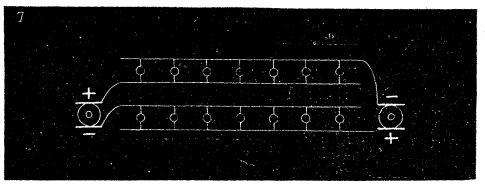
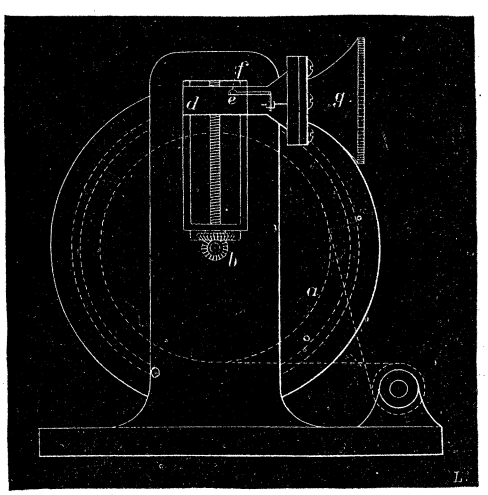


FIG. 2.

Fig. 2 represents an arrangement invented by Mr. J. S. Beesman: it is composed of two dynamos, connected as shown, the two circuits of the dynamos being joined crosswise by the lamps. It will be seen that this arrangement permits each lamp to have the same difference of potential between its extremities, because, as each lamp is nearer one of the dynamos, it is the more distant from the other. If the lines are considered as rails, or other conductors on an electric railway, the speed will be the same at all points of the line; for the difference of potentials between the conductors will be constant: consequently, if several trains of the same weight run over the same line, they will not strain to go by each other.

— Among recent German patents is one issued to D. French St. George of London, for a novel form of phonograph. The cut shows a round photographic plate *a*, upon which a ray of light falls through the opening at *e*. A slide over this opening is connected with the vibrating plate in the mouth-



piece *g* in such a way, that, with the vibrations of the plate, the size of the opening is varied. The result is, that on the photographic disk, which is kept in rotation at a constant rate, there is produced, after development, a dark circle of varying width. In order to reproduce the tones of the voice, a ray of light is sent through this photographic image upon a selenium transmitter of the form invented by A. Graham Bell, and used in his radiophone.

— The Berlin African association despatched an expedition to the Kongo during July, of which Lieut. Schulz is to be the leader. News has been received of the two travellers for this association, — Dr. Richard Böhm, and the engineer, P. Reichard, — of the date of last August. They had crossed Lake Tanganyika with the Belgian agent at Karema, Lieut. Storms, to Qua Mpara, and started across unexplored country for Lake Moeso. The *Illustrirte zeitung* states that Dr. Böhm is to succeed Lieut. Storms in command at Karema. The International African association has founded thirty-two stations in addition to Leopoldville. Ten of these are on the Niadi-Kwilee, twenty on the Congo, and two on the coast. During his last journey, Stanley acquired a considerable length of the river-bank. By means of the steamers and the new roads round the rapids, the journey to Stanley Pool can now be made in fourteen days. Col. Winton has taken the command between Vivi and Stanley Pool.

— M. J. B. Morot, lately deceased, left to the Société de géographie a sum of two thousand francs, the interest of which is to form an annual prize for the French navigator who shall approach nearest to the north pole during the year; or, in default of a suitable receiver, the prize may, at the discretion of the society, accumulate for two years. In the absence of an arctic navigator, it may be awarded to the discoverer of an unknown island or country.

— Capt. Sörensen has determined that the northern point of Europe is not Cape North, as usually assumed, but a promontory called Knivskjoerodde, about ten minutes of longitude west from Cape North, and reaching nearly a thousand metres in a northerly direction beyond the extremity of Cape North.

— Three important memoirs on the geology and geography of eastern Europe have lately appeared. The first, by Dokuchaeff, treats of the distribution of the black loam (chernoi zemlia) of Russia, famed for its fertility. Another, by Paul Veniukoff, considers the distribution of the Devonian rocks of Russia. The third, by Vitikin, discusses the formation of the valleys of central Russia. These, according to the author, are due to a gradual elevation of the land, which left the edges of a shallow sea transformed into plains, across which brooks made their way, cutting out ravines and channels, growing in importance and volume as the area of land enlarged, and finally becoming rivers. There was no lake-period, as in the Baltic region. With few exceptions, the lakes of central Russia are ancient river-beds, cut off by changes in the course of the stream. Behr's law is exemplified in the valleys of the principal streams, which, like the Volga, Viatka, and others, have a general parallelism with the meridian.